

+ + WHAT'S INSIDE + +

Page 1	SINCUS Information and Map	
Page 2	Newsletter Exchanges	Paul Hill, SINCUS
Page 3 & 4	Secretary's Report	Paul Hill, SINCUS
Page 4	<u>MTERM Patch Corrected</u>	Dave Schoenwetter, SINCUS
Page 5	<u>COMPUTUS INTERRUPTUS</u>	Wes Brzozowski, SINCUS
& 6		
Page 7	<u>AN EXTRA SIMPLE SPECTRUM</u>	Wes Brzozowski, SINCUS
& 8	<u>EMULATOR</u>	
Page 9	<u>2K EXPRESS</u>	Gary Ennis, SINCUS
Page 10	<u>TIMEXly Tips</u> more MTERM!	Dave Schoenwetter, SINCUS

* * SINCUS ACTIVITIES * *

-GLASSES- -MEETINGS- -HARD/ZX81-

[Programming, etc.] [Main Thing!!] [Hardware+TS1000]

THURSDAY
February 28
7:00 PM
Vestal Library

WEDNESDAY
February 20
7:00 PM
Chase/First Bank

SUNDAY
February 24
1:00 PM
Vestal Library

THURSDAY
March 28
7:00 PM
Vestal Library

WEDNESDAY
March 20
7:00 PM
Chase/First Bank

SATURDAY
March 23
1:00 PM
Vestal Library

We will continue
to schedule the
programming class
if YOU want it!!

WEDNESDAY
April 17
7:00 PM
Chase/First Bank

SATURDAY
April 27
1:00 PM
Vestal Library

The Executive Committee of SINCUS meets the first Wednesday of the month at the Vestal Public Library at 6:30 PM unless otherwise stated in advance. Any regular SINCUS member is welcome!

SECRETARY'S REPORT



COMPUTER SHOPPER is offering a 6 month rate of \$5 thru user groups. We have the special subscription cards and will have them at the next three meetings. All members will find the basic information in this issue, offer expires 7-31-85 make your check out to COMPUTER SHOPPER for \$5.00 and either turn it in at the meeting or (so corresponding members CAN participate) mail it to SINCUS, P.O. Box 36, Johnson City, New York 13790. Act now as the COMPUTER SHOPPER is trying hard to support Sinclair products

Charlie Keith demoed as promised his 2068 with clock. With his set up, 2068, modem, Gorilla Banana, and interfaces, Charlie included a clock chip. The idea came from an article in Computer & Electronics, "Fail-Safe, Real-Time Clock for the TRS-80 by John V C. Mein. Due to the differences in hardware between the TRS-80 and the 2068, several changes had to be made. Using Dave Schoenwetter's(SINCUS)design for a centronics interface, Charlie built the interface with a MSM5832 clock/calendar. He also rewrote programming for updating and reading the clock for the 2068. With a flip chart of the project showing the planning that you should put into any worthwhile project, he may keep one or two of us from stubbing our toes on similar problems.

Clyde Tackley brought in his Byte-Back modem and some tapes of messages off Comuserve. He demoed how to download programs from Comuserve. Uploading is also possible. In addition to the the modem you also get a RS232 interface.

From "Computers & Electronics" (2/85) , Rumors & Goss), ...Sinclair seems to be developing a new microprocessor chip with parallel processing and RAM on board...don't look for it before 1989.

Gary Ennis posted a bulletin on Comuserve about Dave's Phone patch in SINCUS NEWS- we got several new members as a result! Dave's revising the code-it was supposed to be read across the page, but some read down. It creates a small problem with auto-dial and Dave is working on that plus rewriting the code to a data statement.

Last month I wrote my favorite filtering statement for menus and keeping the program from crashing-I got some input from Gary and Dave on this one-Dave had this

```
10 PRINT "MENU SELECT 1 or 2 "
20 IF INKEY$ = "1" THEN GOTO (or GOSUB) Line number
30 IF INKEY$ = "2" THEN GOTO " " " " "
40 GOTO 10
```

Gary this:

```
10 PRINT "MENU SELECT 1 or 2"
20 LET Z$=INKEY$
30 IF Z$(<"1"OR Z$ > "2" THEN GOTO 10
```

My final choice:

```
10 PRINT "MENU SELECT 1 or 2 "
20 IF INKEY$ <> "1" AND INKEY$ <> "2" THEN GOTO 10
```

=====
I would like to apologize for the mix up on time of the Meet scheduled on January 26-the newsletter said 10 am ,it was supposed to be 1 pm-I did not notice it until about 1:45 pm at the library, when Dave Schoenwetter pointed out to Gary Ennis that several people had showed up at 10 am. I am sorry to those who had gone out in this weather for zip-I talked with Dennis Dale who was to lead the instruction and he hopes that those interested will come to the next instruction in February, and he has a lot of items to show and will go beyond soldering into the world of wire-wrap. Again, sorry about the mix-up in meeting time. In the future, should a time or date be in question call me (798-7219) or Gary (1-687-0698) --Paul Hill
=====

=====
SINCUS met at 7pm on Tuesday, January 15 at the Vestal Public Library for programming class, and at 7pm, Wednesday January 16 at the Chase-1st City Bank, Vestal Parkway at Murray Hill Road, Vestal, for the regular monthly meeting, 18 attended. Please note it was 3 degrees out when the meeting ended at 10pm.
=====

The D. Lipinski "Software Buyers Guide to Sinclair Timex Products and Services" arrived in the mail just before the meet. A list at the meets will be posted-if you want to use the Guide-sign up-keep it 5 days and pass it on to next on the list. Your name and phone number and its up to you to call the next one on the list, last one brings it to the next meeting.

Glenn Wilson, Treasurer, made the annual report for 1984. His efforts in the visual aids made clear where all the money comes from and goes to. The books are always available to any member for inspection. Thank you, Glenn.

Gary Ennis, President, needed shoppers for prices on printer paper and mailing labels. Format for the newsletter is now 64 columns. We are going with a new printer- a couple bucks more, but hopefully easier to read-and closer to Gary's home. Gary was driving 120 miles a month just on the newsletter production.

Dennis Dale will be giving classes in basic soldering and wire wrap. We have a lot of scrap parts to practice with over the next couple months, so if you're interested, come on down. That will be at the Vestal Public Library , 1pm, Sunday, Feb.24, TV room.

COMPUTUS INTERRUPTUS

-OR THE JOY OF USING INTERRUPTS ON YOUR COMPUTER

By Wes Brzozowski, SINCUS

PART TWO

Response to Part One of this series has been quite gratifying so far. However, from what I've heard, it seems that a little "fine tuning" of the format is in order. Essentially, we'll do fewer things in each installment, stretch the series out longer, and give a little more attention to detail. This'll give those new to the subject a little more help and time to catch up. It also means that we won't cover as many things this time as promised, but it will all get done, eventually. Those who are particularly anxious to get on with it should feel free to collar me at SINCUS meetings, with their questions.

I hope readers who own or have access to a TS2040 printer have tried out the demonstrator program. If not, it would be worthwhile to do so before reading further. While we're discussing the last installment, I'd like to call your attention to the second paragraph in the right hand column on page 8. An important sentence has been left out. It should read, "One thing I haven't mentioned is that the address assembled from the I-register and the data bus is NOT the address of the interrupt handler! It's the ADDRESS OF THE ADDRESS of the interrupt handler."

Now back to the questions:

#6 HOW DOES THE DEMONSTRATOR WORK?

Pretty well! Seriously, let's first look at what the demonstrator sets up in memory, and then we'll see how it all works together. Understanding this description will require a bit of knowledge of machine code, but only a bit. The demonstrator has been written to be understood by as wide an audience as possible. (That audience will also need a little persistence, though)

Line 30 CLEARS the necessary space for the interrupt software. Line 40 fills memory locations FE00 to FF00 with FD. Line 50 places a JP FF08 instruction at location FDFD. Lines 60 and 70 load the following machine code, starting at location FF01:

ADDR	HEXCODE	LABEL	MNEMONIC
FF01	3EFE		LD A, FE
FF02	EO47		LD I, A
FF03	ED05E		IM Z
FF04	FC9		RET
FF05	FC5		PUSH AF
FF06	FC5		PUSH BC
FF07	D5		PUSH DE
FF08	FC5		PUSH HL
FF09	3E7E		LD A, 7E
FF0A	DBFE		IN A, (FE)
FF0B	F8E0		OR E0
FF0C	FEFC		OR FC
FF0D	2006		JR NZ, FF1C
FF0E	FD3		DI
FF0F	06C0		LD B, C0
FF10	C0050A		CALL 0A05
FF11	E1		POP HL
FF12	01		POP DE
FF13	11		POP BC
FF14	11		POP AF
FF15	C33800		JP 0038

I've divided the code into five blocks, whose meaning will be explained shortly.

Line 80 executes machine code at location 65281, which, not so coincidentally, is equal to location FF01 in the machine code listing. Only block #1 is executed, since it ends with a RET instruction. Block #1 loads FE into the I-register, and sets the machine into interrupt mode 2, whose operation was explained last time.

From here on, the TS2068 is doing something new that it does not ordinarily do. Every time an interrupt occurs, the machine has to find out where it is to execute the interrupt code. It gets the upper byte of an address from the I-register and the lower byte from the data bus. This combination is the ADDRESS OF THE ADDRESS of the interrupt handler. It will become clearer (hopefully) as we "walk through" what happens.

When the TS2068 gets an interrupt, it looks to the I-register and the data bus to generate the address FExx, where xx is a number that is not known because the TS2068 mysteriously puts different values on the data bus at different times. The TS2068 will then look to memory location FExx for the address of the interrupt handler, and then run the code wherever that happens to be.

However, the BASIC program filled all memory locations from FE00 to FF00 with the number FD, so no matter what value FExx happens to be, the TS2068 will find FDFD when it looks there! This is where it will start to execute the interrupt handler.

Unfortunately, FDFD is just 3 bytes less than FE00, where the "kluge block" of FD's is located. There's not room for much code, but there's just enough space for the JP FF08 instruction that the BASIC program put there. This means that the interrupt handler will continue at location FF08, or, block #2 in the machine code listing. (It gets a lot simpler from here on, honest)

If the explanation seems murky so far, it's O.K. to forget it for awhile. Just take my word for it that the aforementioned code makes it appear that an interrupt will cause code to be executed at location FF08. This is where our true interrupt handler is to be found.

The handler begins with block #2, which saves all of the registers. We do this so that we can leave them as we found them when we're done. This will ensure that we don't disrupt the program that was running when the interrupt occurred.

Block #3 reads a small portion of the keyboard. We won't cover keyboard scanning here (see SYNTAX Feb. 1984 for a tutorial on the subject) but block #3 causes block #4 to be skipped if the BREAK and SYMBOL SHIFT keys are not being pressed simultaneously.

Block #4 causes the screen to be copied. Before CALLING the screen copy routine in ROM, we load B with the number of pixel lines to be copied. Changing this would allow us to COPY part of the screen.

Block #5 prepares the computer to leave our interrupt handler. All registers are restored to their original values. Note that the first item that POPs off the stack is the last item that was PUSHed on. This means the registers must be restored in reverse order.

AN EXTRA SIMPLE SPECTRUM EMULATOR

-by WeS Brzozowski, SINCUS

No one wants to be called simple, or cheap. Yet where engineering solutions are concerned, both of these things are virtues of immeasurable value. The method described here is the cheapest and simplest emulator yet, if we don't count merely swapping ROMs inside the TS2068. Among methods that allow switching between the Spectrum and TS2068 modes, it's definitely the simplest and cheapest, and I think it's also the best. Still, that last statement may be debated, depending on what you prefer.

In the October 1984 issue of SINCUS NEWS, I proposed a method of producing a cartridge based emulator that used a Spectrum ROM, where mode switching is performed through software. Doug Dewey of the Triangle Sinclair User's Group, was the first to actually try this method out, and he's redesigned his emulator to accommodate it. I suspect that the majority of readers prefer programming to soldering; no one has damaged their TS2068 with a bad program after all. For these people, I'd recommend you contact Doug for details on his product. Nevertheless, for those who'd like to "roll their own", I've provided instructions to do just that -- requiring no electronic components except one Spectrum ROM!

This further simplification of my emulator method means that less wiring will be required. Such a feature will be especially useful to those just starting out in building electronic projects. For those who don't mind things being a little more complicated, the optional seven resistors make the TS2068 act a little more like a Spectrum. (The TS2068 does weird things to the data bus when there's no hardware writing to it, while the Spectrum, puts an FF there. Those with access to a real Spectrum can try PRINT IN 0 on both computers, to see the difference.) I have actually seen software in which these resistors matter. Certain software methods using interrupt mode 2 form a prime example.

Those with some technical knowledge of the TS2068 may have a few questions about this method. I'll try to answer some of the more likely ones here.

First, the code in locations 0001-0004 of a Spectrum ROM does not follow the format specified for the cartridge memory in the TS2068 technical manual. Actually, this is very fortunate. If we walk through the initialization code where the cartridge memory is checked, we see that if the "standard" format is not followed the computer simply assumes that no cartridge is present and continues on. Thus turned on, it "wakes up" as a TS2068. Because of this, we can use software to switch back and forth. If the standard format were followed, it would not be possible to switch from the Spectrum to the TS2068 mode without some sophisticated machine code.

Second, as shown, the Spectrum ROM is not uniquely mapped into the computer's memory. That is, it is mapped simultaneously into the 0-16, 16-32, 32-48 and 48-64K blocks of memory. However, in normal use, only chunks 0 and 1 of the cartridge bank will be enabled, and so the TS2068 itself performs the additional mapping, so that the ROM occupies only the 0-16K area, as it should.

There is evidence that Timex intended to do this in its own cartridges. Cartridges could have been either AROS, starting at location 8000. The byte at location 0001 should be 01 to identify an LROS, and the byte at 8001 should be 02 to identify a LROS. In either case, this is the second-to-the-lowest byte of ROM memory. Note that the format could have been simplified by using 01 to identify either, but this would not have been so if the ROM were mapped into multiple blocks. The difference between the two I.D. bytes is probably intended to tell the TS2068 where it should "map" the ROM, by enabling the appropriate cartridge bank chunks. By also locating decoupling capacitors right next to the cartridge connector, Timex ensured that a program that could fit on one ROM would require only one ROM on a board, and nothing more. (Programs requiring two ROMs would have required a third mapping chip.)

I expect that it's not just a happy coincidence that the standard ROM configuration includes three "low true" enabling lines, and that to enable the cartridge ROM we must simultaneously have a active "low true" signals; MREGB, RDB, and ROSCS. Unfortunately the standard EPROM has only two "low true" enabling lines, so this one chip method won't apply to EPROMS.

A third possible question may relate to the lack of a pullup resistor on D2. If we review the TS2068 schematic, we see that D2, and only D2 already has a 10K pullup resistor; we don't need to add one here. This is probably used during the system initialization, when the TS2068 is building the system configuration tables, and is searching for the expansion banks that Timex never produced (poor dumb machine!) A ROM bank is identified by bit 2=0 in a certain location. A missing bank would have bit 2=1 due to the pullup resistor. Since no other pullups appear necessary, Timex didn't include them.

A last question may relate to the lines of BASIC next to the schematic. They're intended to be entered in the immediate mode; don't try to put line numbers on them and SAVE them. Such a cassette switch won't work. If you want a cassette switch, you can use this program instead:

```
10 CLEAR 39999
20 DATA 175, 24, 2, 62, 3, 243, 211,
244, 199
30 FOR J=40000 TO 40008: READ
a: POKE J, a: NEXT J
": 40 PRINT "Press S for Spectrum
": PRINT "Press T for TS2068": B
EEP 1, 11
50 IF INKEY$="S" OR INKEY$="s"
THEN RANDOMIZE USR 40003
60 IF INKEY$="T" OR INKEY$="t"
THEN RANDOMIZE USR 40000
70 GO TO 50
```

EXCITING CLASSES

You may find the "cassette switch" useful when you're getting started, but you'll quickly find the lines of BASIC by the schematic to be easier.

The OUT 244, commands switch the Spectrum ROM in and out of memory, causing a system crash. The RANDOMIZEUSR 0 commands initialize the system, allowing a "controlled crash" from which the system can recover, with the newly switched in ROM. This method is about as elegant as lobster with catsup, but it works beautifully, and is perfectly "legal".

That's about it. Those with additional questions can write to me
 Wes Brzozowski
 337 Janice Street
 Endicott, NY 13760

Please enclose a SASE for a reply. The truly anxious can call me at (607) 785-7007. Please DO NOT call collect. Please DO NOT call after 10pm Eastern time. I'll be glad to answer any questions.

NOTE: My articles are never bear any copyrights. I design and write because I enjoy it. Anyone wishing to manufacture and sell this item is free to do so, but I'd appreciate you're sending me one or two of the finished item as a courtesy. Have Fun !

MASTER THE PERSONAL COMPUTER

Eight weeks of concentrated "hands on" use of the most popular home computer applications-AND ALL DONE ON TS 2068s!!!! Subjects:

- #1 BITS, BYTES, & BUZZWORDS
- #2 GETTING THE COMPUTER TO OBEY!
- #3 THE ELECTRONIC 3x5 CARD FILE
- #4 BUDGETS and Other MONEY MANAGERS
- #5 STUDYING WITH THE COMPUTERIZED TEACHER

- #6 THE ELECTRONIC LETTER
- #7 THE ELECTRONIC LEDGER BOOK
- #8 TALK TO THE WORLD WITH YOUR COMPUTER

Meets MONDAY nights in Owego - \$28 is cost.
 Next sequence will start on Monday, March 25

Write 2K EXPRESS, PO 523, Owego, NY 13827
 Call (607) 687-2241 (9am - 6pm daily)
 (607) 687-0698 (home)

See Gary Ennis at the Feb. or Mar. meet

EXTRA SIMPLE SPECTRUM EMULATOR. MAY BE BUILT AS A PLUG-IN CARTRIDGE, OR ATTACHED AT THE REAR CONNECTOR.

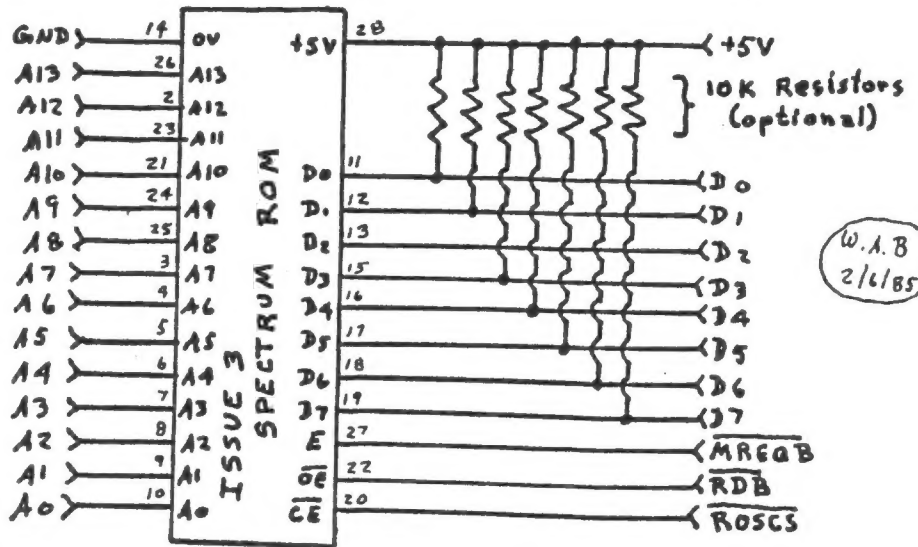
TS2068 TO SPECTRUM:

RANDOMIZEUSR 0
 OUT 244, 3
 RANDOMIZEUSR 0

SPECTRUM TO TS2068:

RANDOMIZEUSR 0
 OUT 244, 0
 - when you get a cursor, press ENTER.
 The computer will honk at you. Then:
 RANDOMIZEUSR 0

(NOTE: The system will re-initialize after every RANDOMIZEUSR 0)



W.A.B
 2/6/85

E XSIMYEMU



This has been a difficult issue to get out as my body had chosen this week to succumb to the local "flu": Many thanks to Paul Hill who drove out and helped with the typing. Additional thank yous go to:

CARL MORRIS - for his trip to Owego to report on the "paper purchase". In addition to his detailed report, he donated printer paper and labels to SINCUS, or this SINCUS NEWS might have been done on napkins!!

THOSE HAVING FULL SIZED PRINTERS AND WANTING TO BUY A CASE OF PAPER AS CHEAPLY AS POSSIBLE - COME TO THE NEXT MEETING AND BRING SOME MONEY!! Case price will be a little under \$30. You will be able to pick up the paper at the February 28 class!

DAVE SCHOENWETTER - for his untiring efforts in attempting to work out the "bugs" in the SMART II modem software. I promise you that if you will use your TS2068 for telecommunications with a full sized printer you will have the "best computing dollar value on the entire personal computer market"!!! Even paying top dollar for a TS2068 and modem-you've got less invested than the price of a modem and software for all other computers. The singular reason is that Dave has taken hours to unravel this mysterious modem software. Dave has developed the "mterm" patch on page 4 that allows you to use your AERCOD I/F with the 2050 modem. The next step (in March SINCUS NEWS) will be a Buffer Utility program so you can fill the BUFFER and then save it to tape OR print it out! And the final step, which Dave has "somewhat" accomplished is the loading of the "saved buffer data" into TASWORD II. We are within a couple of months of you "authors" sending me your newsletter articles over the phone lines to my system even if I am not here!!!

WES BRZOWSKI - for his apparant solving of the inexpensive, build it yourself, Spectrum ROM Emulator. This device which will cost you \$35 or so to build will allow you to switch your TS2068 back and forth to being also a "Spectrum". The advantage - very straight forward - Spectrum is probably the #1 selling computer in England with a ton of outstanding software (4,000 titles?). If you want the most up to date software for one of the world's most popular home computers-it is at your finger tips! Think about it.

"CLONE" - to be sold to SINCUS MEMBERS at February Meeting. If you attended the January meeting you saw "CLONE" in action. Wes Brzowski has officially "donated" CLONE to the 2K EXPRESS for the purpose of registering the copyright. 2K EXPRESS then donates all rights to SINCUS. SINCUS will be selling an initial supply of "CLONE" at the February meeting. COST to members will be under \$10 (price could not be established at press time). If you have not seen "CLONE" please come to the meeting - it copies any Sinclair program for the TS2068!

SPECIAL "CLONE" SALES PROJECT

SINCUS will be making "CLONE" available to be sold commercially. Quite simply stated - if you would like to sell "CLONE", then send a proposal to SINCUS NEWS, PO Box 523, Owego, NY 13827 We invite all "entrepreneurs" to consider this chance and respond accordingly - if you're going to sell microdrives or disk drives then your customer needs a way to copy the cassette software to the new storage media!!! CLONE permits it at the press of "C"

STATE OF SINCUS REPORT

I now see nearly everything "online" and working that I first envisioned when I became President of SINCUS. The membership rolls are kept on VU-FILE and mailing labels are printed on a full printer. Meeting notes are part of the newsletter and kept as a file for TASWORD. SINCUS NEWS is being printed within two blocks of my business and is acceptable in a 64 character column format. SINCUS NEWS has much improved artwork and the production time is roughly 20% of what it was a year ago, the quality is better and the cost really is no more-except for the POSTAGE. In the next few days we will finally begin the "permanent" filing of the back articles of SINCUS NEWS-including a master index kept on VU-FILE so that you can find all of those articles pertaining to the subject you want!! This will take a few weeks but it is close. SINCUS is running classes in programming, the "world of hardware", and ZX-81 in addition to monthly meetings. Finally, I see the availability of a "very expensive telecommunications network" for those that are interested - but it will actually be very cheap!

TIME~~X~~^{ly} TIPS

MTERM SMART II HELP FILE

The transmit function supports X/ON - X/OFF protocol. Use CTRL S or CTRL Q.

The receive buffer may be OPEN/CLOSED remotely. Send CTRL R (open, decimal code 18) or CTRL T (close, decimal code 20).

Scroll pause when "VIEWING the BUFFER" use space bar ENTER to resume VIEWING.

Transmitting with the buffer OPEN and in HALF DUPLEX will fill the buffer with a copy of the transmitted data.

Transmitting or Receiving a program will require the BUFFER CON:HEX mode.

EXIT to BASIC with the BUFFER FULL may cause system to hang. (POWER OFF required)

DOWNLOADED programs with receive errors may not list, erasing buffer and second try may not work, even though the data is received correctly.

When TRANSMITTING a file the PROMPT STRING is the string of characters the receiving terminal must send to start the transmission and after each line it must be repeated to send the next. Just ENTER will default to NO PROMPT STRING. The character delay may be set from 0 to 255. 0 is default.

***** PATCH FOR THE PATCH *****

The "MTERM SMART II PATCH for AERCO I/F" from the last jnth issue of SINCUS creates a problem when auto-dialing, the modem does not "CONNECT" when the line is answered. Using the CAPS SHIFT & ENTER and "M" to make the CONNECT will work. The code that checks the print buffer and printer busy on a status read from the serial port is incorrect. To eliminate this problem, the following bytes must be changed in the patch procedure:

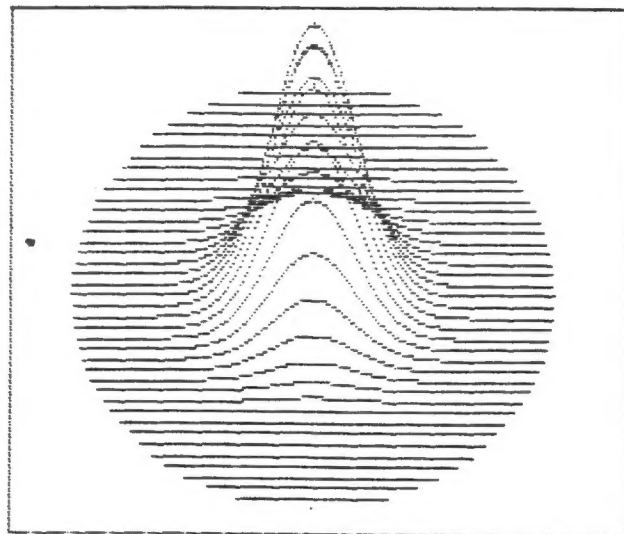
58755-245	58756-197	58757-229	58758-42	58759-176
58760-229	58761-237	58762-75	58763-174	58764-229
58765-237	58766-66	58767-32	58768-4	58769-225
58770-193	58771-241			

The patch when applied will cause the auto dial and the keyboard to be slower. This happens because the added code must check the print buffer and the status of the printer busy line each time the serial port status is read. If this response is not tolerable and you still desire to print to the AERCO I/F then the portion of the patch which prints data from the buffer can be installed by POKING just the data to locations 58618 to 58735.

Installing the patch may prove difficult because of the large number of locations which must be altered, compounded by the fact that one byte incorrect will cause unpredictable results. I have found that entering a BASIC program using DATA lines and FOR/NEXT loops works the best. This program can be saved on tape and each line edited if necessary. See examples:

THE "MTERM PATCH PROGRAM" IS FULLY LISTED ON PAGE 4. LOAD THE "mterm" CODE and the type in the program and RUN. When all is done you should make the SAVE by

SAVE "patch" CODE 54016,7721



```

10 REM THIS ROUTINE PLOTS THE
50 REM SET COLORS
55 BORDER 4
60 INK 0
70 PAPER 6
80 REM DRAW BORDER
90 GO SUB 400
100 REM DEFINE FUNCTION TO BE P
LOTTED
105 REM
110 REM THE IS CHANGED BYALTERI
NG THE CONTENTS OF LINE 150
120 REM
150 DEF FN A(Z)=90*EXP (-Z*Z/60
0)
195 REM
200 REM PLOT GRAPH
205 REM
210 LET K=5
220 FOR X=-100 TO 100 STEP 1
230 LET L=0
240 LET P=1
250 LET Z1=0
260 LET Y1=K*INT (SOR (10000-X*
X)/K)
270 FOR Y=Y1 TO -Y1 STEP -K
280 LET Z=INT (80+FN A(SOR (X*X
+Y*Y))-.707106*Y)
290 IF Z>L THEN GO TO 320
295 GO SUB 380
300 LET L=Z
310 IF P=0 THEN GO SUB 380: IF
Z=Z1 THEN GO SUB 380
320 PLOT X+125,Z
330 IF P=0 THEN LET Z1=Z
340 LET P=0
350 NEXT Y
360 NEXT X
370 GO SUB 390
380 RETURN
390 STOP
395 REM
400 REM DRAW BORDER
405 REM
410 PLOT 0,0
420 DRAW 255,0
430 DRAW 0,175
440 DRAW -255,0
450 DRAW 0,-175
460 RETURN

```

10